

SCIENCE AND TECHNOLOGY
COMMITTEE

THE ROUTES THROUGH WHICH
THE SCIENCE BASE IS TRANSLATED
INTO INNOVATIVE AND
COMPETITIVE TECHNOLOGY

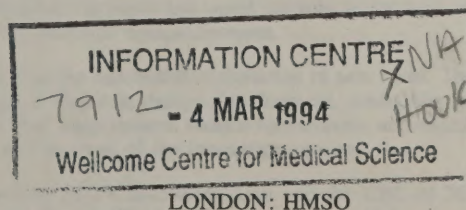
MINUTES OF EVIDENCE

Wednesday 8 December 1993

DEPARTMENT OF TRADE AND INDUSTRY

Dr Robinson, Dr Dobbie and Dr Hicks

*Ordered by The House of Commons to be printed
8 December 1993*



LONDON: HMSO

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WEDNESDAY 8 DECEMBER 1993

Members present:

Sir Giles Shaw, in the Chair

Mr Spencer Batiste	Mr Andrew Miller
Dr Jeremy Bray	Mr William Powell
Mrs Anne Campbell	Sir Trevor Skeet
Cheryl Gillan	Sir Gerard Vaughan
Dr Lynne Jones	Dr Alan W Williams

Memorandum submitted by the Department of Trade and Industry (24 September 1993)

INTRODUCTION

This memorandum sets out how DTI proposes to undertake its mission statement which was set out in the Government's recent White Paper "Realising our Potential—A Strategy for Science, Engineering and Technology" (Cm 2250), published on 26 May 1993. This mission statement says:

"The Department's main role is to stimulate innovation in industry so as to enhance competitiveness in home and world markets. To fulfil this role, the Department promotes the importance of innovation and its management; encourages industrial research and development, the spread of best practice and the transfer and diffusion of technology; encourages interaction between industry and all other providers of science and technology, whether based in the United Kingdom or elsewhere; and funds research and development in support of Departmental policy objectives. The Department also represents the views of business in the development and implementation of Government policy on science and technology."

DTI's RE-FOCUSED INNOVATION POLICY

In parallel with the discussions leading up to the publication of the White Paper, DTI reviewed its own innovation policy and programmes to ensure they contribute, as effectively as possible, to improving industrial competitiveness and wealth creation. On 26 May 1993, as a result of this review, DTI announced a re-focusing of its innovation policy to build on the new partnership between Government, industry and the science base announced in the White Paper and to set the framework for the Department to carry out its new mission statement.

The main theme of DTI's new strategy is better to facilitate companies' access to, and use of, technology so as to improve industry's competitiveness. DTI needs to make the most effective use of the comparatively limited resources it has available. For instance, current support for industrial R&D projects from DTI's innovation budget is less than 2 per cent of industry's own R&D spend. In view of this, DTI will shift the balance of its innovation support away from generating new technology—on which industry and Government already spend billions—to concentrate on the exploitation and transfer of technology and the promotion of innovation.

DTI will increasingly concentrate on improving the environment for the adoption and exploitation of technology in the market-place. In practice, DTI's activities will centre on five broad fronts:

- Influencing the general business environment.
- Fostering the climate for innovation.
- Developing and maintaining the infrastructure providing innovation and technology services.
- Stimulating the adoption of technology (wherever it is developed).
- Stimulating the development of technology.

1. Influencing the general business environment

DTI's primary responsibility lies in the area of wealth creation. The Department's principal aim is to help UK business compete successfully in home and world markets. Innovation, of which science and technology are a part, is a key factor in industrial competitiveness.

Innovation can be defined as the successful exploitation of new ideas. The innovation process applies to all aspects of business, such as research, design, development, production, purchasing, marketing, etc., and has particularly close links with management, finance for business, and education and training. Research and development is therefore just *one* part of the innovation process.

A joint study carried out by DTI's Innovation Unit and the CBI, of 76 UK companies' attitudes and practices in innovation, showed that only 1 in 10 companies could be considered innovative in *all* aspects

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of their business. Whilst 3 in 10 of the companies demonstrated a number of facets of the innovation process and 5 in 10 showed elements of good performance, UK companies as a whole need to improve their innovative performance to be internationally competitive.

The innovation process should influence all aspects of business; it is a management issue, rather than one relating specifically to any one aspect of business, the level of R&D spend, for example, or to the rate of adoption of new process technology. Improvement and development of individual aspects of business have an important role; they are the fundamental tools which will move the business forward. The development must however take place in an environment conducive to the adoption and exploitation of new ideas and be carried out as part of a strategic view of the future.

DTI is placing greater emphasis on demonstrating to companies, whether large or small, that good innovation practices throughout *all* aspects of business can improve their competitiveness and profitability. The programme of events planned for DTI's "Managing in the 90s" programme, from the Strategy Road Show, through Workshops and self-help tools, to the creation of Competitiveness Clubs, aims to convince companies of the benefits of adopting an innovative approach to business.

2. *Fostering the climate for innovation*

Although many companies are becoming aware of the importance of innovation to competitiveness, there is still much work to be done in improving the overall climate for innovation. It is not just the business environment where innovation is important; others in the economy, such as financial institutions, the education sector, the media, etc., need to appreciate the importance of innovation.

DTI's Innovation Unit has just this task. Its primary function is to fulfil that part of DTI's mission which is to "promote the importance of innovation and its management". The work of the Unit complements that undertaken to deliver the rest of DTI's mission statement and adds value to what business and its various support organisations are already doing, by helping to establish a climate more conducive to innovation through, for example:

- Encouraging public debate.
- Fostering local and national links and networks.
- Publicising success.
- Encouraging active involvement by key players.
- Encouraging Government to do its job better.

Following the White Paper, DTI is placing more effort on improving the climate for innovation. The Innovation Unit, which now reports directly to DTI's Chief Adviser on Science and Technology, and has a wide remit across DTI, is being expanded in size. The number of senior business people seconded to the Unit is being increased from six up to about 20, with much of the increased effort being devoted to regional/local activities throughout the UK.

Specific activities which the Innovation unit is encouraging or facilitating include:

- (i) The spread of innovation best practice among companies through DTI's "Managing in 90s" Programme.
- (ii) Further work on establishing best practice, on methods for bench-marking company performance and on company access to sources of best practice.
- (iii) Development of an innovation index leading to a company scoreboard of innovative performance to complement and extend the now established UK R&D Scoreboard.
- (iv) Development by the financial community of a good practice code on "patient" money/trustee and shareholder behaviour, to complement the Engineering Sector Dialogue Team's Good Disclosure Practice Code.
- (v) The third annual UK Innovation Lecture in February 1994.
- (vi) Take up by 5,000 Secondary Schools of the Wealth from Science and Engineering series of videos and teacher support materials.

3. *Developing and maintaining the infrastructure providing innovation and technology services*

In addition to a business environment and an overall climate geared to innovation, companies benefit from a strong infrastructure through which technology and innovative ideas can be delivered. Increasingly, firms need effective *local* delivery of technology that may have originated from not just a local or UK source, but from a global basis. Therefore, both the access to such technology and the infrastructure which can provide it, will need to be strengthened.

DTI is therefore enhancing the UK's innovation and technology infrastructure through the development of Business Links (One Stop Shops) and local technology transfer networks.

Business Links will increasingly become the focal points for bringing together customer driven, public and private sector, business services. These One Stop Shops will provide clients with advice on, and access to,

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DTI national and regional support and to the wide range of technological services provided by commercial organisations, higher education institutes, etc. Innovation services, delivered through Business Links, will be provided by Technology Counsellors and will include help to find solutions to technological problems, advice on technology opportunities and on the management of innovation.

The Department intends to use the new Business Link network to link in with the EC's Relay Centres, which have been established in Community countries, both to promote the opportunities available under the EC Framework Programme and to disseminate the results of such research.

Local technology transfer networks in the UK, of the type that Business Links and firms directly can draw on, are fragmented compared to abroad. The DTI aims to stimulate more effective networks, much better able to deliver local access to a supply of technology related advice and services, particularly for Small and Medium-sized Enterprises (SMEs), and which will also embrace national and international sources of expertise.

4. Stimulating the adoption of technology (wherever it is developed)

The process by which the appropriate elements of technology to enhance competitiveness are acquired by firms are known collectively as technology transfer. DTI has traditionally recognised the importance of technology transfer and has undertaken a number of significant initiatives, most notably the "Managing in the 90s" programme.

In any particular area of innovation, technology, or otherwise, only a limited number of companies will be "leading the field". However, for the UK as a whole to be successful, awareness of new ideas, new technology and best practice must diffuse through, and be adopted by, the great mass of companies, as rapidly and effectively as possible. DTI is therefore concentrating its efforts and resources on encouraging greater and more widespread adoption of technology, whether the technology has been developed in the UK or overseas.

In this way, DTI is fulfilling its mission to encourage the spread of best practice and the transfer and diffusion of technology through:

- Enhanced information and brokerage services for science and technology from overseas. The aim of the services will be to improve the information capture and dissemination of overseas technology opportunities for commercial exploitation by UK companies.
- Advice and help in diagnosing problems and obtaining access to technology and innovation consultancy through the Business Links and their technology counsellors and making use of the diagnostic and brokerage services planned to succeed the Enterprise Initiative Consultancy Scheme.
- Stimulating interaction between industry and the science and engineering base through support for activities under, e.g., the LINK initiative, the Teaching Company Scheme and the Post-Graduate Training Pilots.

In other, more specialised fields of technology, diffusion is equally important. In space, for example, the European Space Agency (ESA) has set up its own programme to promote more effective diffusion of space technologies. The programme is at a relatively early stage but has already attracted considerable interest and achieved technology transfer in several instances. Examples involving technologies developed by UK companies include use of miniature pumps for medical applications and data compression techniques in video security systems. Just as important is the access provided to UK industry for technology developed by non-UK companies. Although most of the work for ESA programmes is undertaken elsewhere in Europe, the technology is available for UK industry to exploit in non-space applications.

5. Stimulating the development of technology

Generating new technology is primarily the responsibility of industry. In most cases, DTI could only ever hope to have a marginal impact given the relative spending of the Department compared with industry. DTI is therefore concentrating its limited innovation support on areas where it will have most effect, i.e., improving companies access to, and use of, technology. Direct funding for the development of new technologies through industry/industry collaborations will be limited to only those proposals which offer exceptional economic benefit.

However, DTI funding for the development of new technologies through industry/science base collaborations will continue under the LINK scheme. In addition, SMEs will continue to be eligible for DTI grant support, for the development of new products and processes, under the SMART and SPUR schemes. DTI also continues to offer support through the EUREKA initiative which is designed to encourage collaborative research on a pan-European basis.

LINK: DTI remains involved in the Government-wide LINK Initiative as the principal UK-based scheme for promoting collaborative research and development and technology transfer between the

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science base and industry. DTI believes that LINK has a role to play in, amongst other things, producing research outputs that can be commercially exploited subsequently. At present DTI is involved in 30 of the 32 LINK programmes underway and will remain a major sponsor. The Department gives special priority to supporting programmes that encourage the involvement of small firms, particularly those that have not participated in collaboration before. It also encourages programmes that require multidisciplinary collaboration across traditional sectoral and scientific boundaries, as these are considered particularly beneficial.

SMART and SPUR: DTI continues to offer SMEs single company support for R&D projects through two main schemes: the Small Firms Merit Award for Research and Technology (SMART) and Support for Products Under Research (SPUR). SMART is aimed primarily at speeding start-up or very small company developments through a competition for individuals or firms with fewer than 50 employees to develop innovative ideas. SPUR supports SMEs to develop new products and processes; the present SPUR programme ends on 31 March 1994. SMEs are not a homogeneous mix and, although the two schemes share a number of common features, they have different objectives, modes of operation and terms of support.

EUREKA: EUREKA is an industry-led European initiative to foster collaborative technology projects. Over the last three years the UK has had very considerable success in increasing the level of project participation in EUREKA. Particularly with regard to projects granted EUREKA status in 1992-93, many of these new UK project participations have proceeded without Government financial support. Building on this, the Department has decided that, from 1 September 1993, its EUREKA support should be focused on the project generation stage, with implementation phase support for companies confined to SMEs. Project generation support will comprise, particularly, assistance for feasibility studies—helping companies to assess potential projects and locate partners. At the policy level, the Department, through its representation in EUREKA structures, will be endeavouring to maintain the light bureaucracy and flexibility which is so valued by industry.

There are a number of other areas where DTI will continue to support the development of new technologies in specialised fields, where cost or market forces justify the need for Government support, such as space, aeronautics and energy technologies.

Space

Space continues to be a new frontier requiring the development of new technology both to provide new capabilities in space and to be able to exploit them on the ground. DTI's objective in the space field is to foster the development of new technologies with good commercial potential and to help UK industry to exploit these to best advantage in the market-place. In pursuing this objective the Department draws on the space science activities undertaken by its partner Research Councils, including work they commission in universities.

DTI's current priority goal is to develop the technologies and systems necessary to enable satellites to observe the Earth from low orbit and to relay back high volumes of data which can be used for a wide range of commercial and environmental purposes. Most of DTI's present expenditure is spent, mainly through the programmes of the European Space Agency, on developing Earth observation satellite/instrument technologies and on data handling systems required to collect, process and disseminate the satellite data generated. Remaining expenditure is largely incurred on developing advanced telecommunication satellite systems designed to build on UK industry's existing strength in this now maturing sector.

Aeronautics

The DTI's role in facilitating industry's acquisition of aeronautical technology has been considered by an official inter-departmental Working Group, set up to consider DTI's response to the Aviation Committee's National Strategic Technology Acquisition Plan (NSTAP). NSTAP sets out industry's priorities for technological development over the next 20 years. They were formally adopted by DTI in July 1993 and will be used to inform DTI's work in the design of its own aeronautics policies and in its discussions with the providers of other publicly funded S&T programmes in both Whitehall and Europe.

DTI Ministers have already ensured that work funded under the Civil Aircraft Research and Demonstration Programme (CARAD) is focused on NSTAP priorities. Over the coming months, DTI will be working with industry, other Government Departments and the science and engineering base to identify ways of helping the aeronautics industry meet its priority needs.

Many of the future aeronautics projects will be collaborative and arrangements will depend on bringing technology capability to the table. Universities and other science base institutions will continue to play a key role in such collaborations, which will also further promote the spread of best practice and the transfer and diffusion of technology. DTI support for research continues to promote such arrangements.

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Energy

The Department's energy R&D programmes flow from the energy policy objectives of economic development of indigenous resources and the provision of secure, diverse and economic supplies into the future. Energy objectives do not centre primarily on industrial policy or wealth creation *per se*, although there is an obvious overlap with them. Energy programmes are mainly focused on specific requirements relevant to the wider objectives, rather than open to industry to seek support for its own ideas (although the offshore industrial support programme is a partial exception to this general rule).

It is the norm for non-nuclear energy programmes to be of a collaborative nature and the partner(s) are usually drawn from industry and (sometimes) the science base. These partners retain the intellectual property gained via the collaboration—the purpose of departmental involvement is to get new knowledge into the marketplace and to encourage commercial exploitation. All non-nuclear energy programmes have sector advisory bodies with external membership, which ensure that the department is aware of concerns and needs in the wider energy community, that our research takes account of these concerns as well as our own view of long-term energy objectives, and that, conversely, industry is aware of what the Department is doing or intends to do.

CONCLUSION

The Science, Engineering and Technology White Paper has brought a widely welcomed commitment by Government to a new partnership with industry and the science base. The re-focusing of DTT's innovation policy will better enable the Department to carry out its mission as set out in the White Paper, in particular, to encourage the theme of partnership, in its widest sense, and to stimulate innovation in UK industry.

QUESTIONS THE COMMITTEE HOPES TO ADDRESS IN THEIR INQUIRY

1. *What is the relationship between the science base and industrial innovation?*

The science and engineering base (which includes academia and research organisations) has, as its objectives, both training and education and research output. In many cases these are combined—particularly at the post-graduate level. On both counts the science and engineering base has a role to play in industrial innovation, especially via the transfer of skilled people and thereby know-how.

The concept of skills and technology transfer via a linear model from academia to industry is now largely discredited. The reality is far more complex. However, for firms to access and then successfully exploit new technology, there will often need to be at least an understanding, if not a collaboration or interaction, with a "science base" organisation, be it a university department or research organisation. For this to work well there needs to be a common language between the partners and an understanding of the different agendas of industry and the science and engineering base. The success of this interaction, via the training and awareness of individuals, is key to the contribution the science and engineering base can make to industrial innovation. DTT will continue to actively encourage greater development of this important interface.

2. *Are the mechanisms for technology transfer and interaction between the science base and industry effective?*

Effective technology transfer and diffusion requires a mix of activities encompassing awareness and information, development and demonstration, consultancy and training and direct company support, to meet the different needs of different technologies and organisations. However, there is considerable room for improving the effectiveness of these technology transfer mechanisms and increasing the general interaction between the science and engineering base and industry in the UK. DTT is therefore concentrating more effort on stimulating technology transfer through programmes such as "Managing in the 90s", local technology transfer networks, the Teaching Company Scheme, Post-Graduate Training Partnerships and LINK.

The Teaching Company Scheme (TCS) is one of the most successful methods supported by DTT for encouraging interaction between UK industry and the science and engineering base. The TCS mission is to strengthen the competitiveness and wealth creation of the UK by the stimulation of innovation in industry through partnerships between industry and academia. The objectives of TCS, which facilitates the transfer of technology to UK industry from the UK's universities, are very much in tune with the DTT's S&T mission statement. TCS also helps the spread of technical and management skills and encourages industrial investment in research and development. By ensuring joint supervision by academic and industrial staff of the project work, which is undertaken by Teaching Company Associates (young high quality graduates) during their two year long industrial placements, collaborative research and development projects are stimulated and new and lasting partnerships between academia and business forged.

The Post-Graduate Training Partnership is a partnership scheme for industrially related training and is aimed at testing the practicality and benefits of placing groups of students in an industrial research environment. It is essentially a partnership between selected universities and industrial research organisations

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(IROs) where students carry out their research in the IRO while receiving academic supervision and course work from the university. It is aimed at providing research training relevant to a career in industry and is intended to foster closer links between the science base, IROs and industry.

The Department remains committed to the interdepartmental LINK Initiative as the principal UK-based scheme for promoting collaborative research and development and technology transfer between the science base and industry. It believes that the Initiative has a central role to play in changing the cultural attitude to collaboration, transferring skills and technology and producing research outputs that can be commercially exploited subsequently. At present DTI is involved in 30 of the 32 LINK programmes underway and will remain a major sponsor. The Department gives special priority to supporting programmes that encourage the involvement of smaller firms, particularly those that have not participated in collaborations before. Further, it encourages programmes that require multidisciplinary collaboration across traditional sectoral and scientific boundaries.

3. Is industrial innovation hindered by a lack of competent personnel, both technologically and in management skills?

There is, undoubtedly, widespread concern that managers in UK firms are failing to exploit technological know-how to its full potential. This is all too often a justified concern. The lack of technological competences is widely acknowledged as a problem, for example, in the shortage of trained technicians, the shortage of up-to-date equipment in colleges of further education, and insufficient SME involvement in the design and delivery of technical skills training. The Government is therefore addressing the problem of technological literacy among school leavers through the national curriculum and outlined a number of ways to improve scientific education in the recent White Paper (Chapter 7).

There is also the problem of a lack of a culture of innovation within companies. Once innovation, in its broadest sense, is recognised as central to the continued success of a firm—and real “ownership” of the concepts established—UK managers and technologists have demonstrated their ability to succeed. The slowly growing number of “moderately” successful firms that have developed into highly innovative UK companies supports this.

The process now needs to be accelerated. DTI's new focus on best practice, the management of innovation, greater cross boundary dialogue and technology awareness is directed towards this goal.

4. Is innovation by British industry internationally competitive? How should this competitiveness be measured?

Innovation is a crucial element in competitiveness. However, it is the output of the innovation process that is important. This is very difficult to measure directly.

The findings of a joint study by the DTI and the CBI of the performance of UK-based companies in innovation, showed that the UK still had some way to go to meet the best of its international competitors.

The DTI/CBI survey, “Innovation—the best practice”, showed that only one in 10 of the companies surveyed could be said to be truly innovative. However, three in 10 demonstrated a number of facets of the innovation process, while five in 10 show elements of good performance. This shows that there is scope for individual companies to improve their competitiveness by putting more effort into the areas where they are weak.

The 1993 UK R&D Scoreboard, published in June 1993, shows a welcome increased in the R&D spend reported by UK companies. However, it also shows that the UK is not investing in R&D at the same rate as our international competitors. Also, while spend on R&D is a major factor for technology based companies, it is not the only one. How existing technology is exploited and how receptive all areas of a company can be to new ideas and ways of doing business are equally important. DTI therefore plans to help demonstrate to UK companies how the yield from R&D spend can be increased through better management of the innovation process.

5. Is short-termism really a problem for innovative British Industry? If so, why is this, and how might it be remedied?

There is no conclusive evidence that so called “short-termism” is a general problem in UK manufacturing industry. However, the Government regards it as important that both firms and financial markets should value appropriate long-term strategies and long-term capital investments, as well as investments in intangible assets such as training and research and development.

The Government regards good relationships between financial institutions and industry as vital long-term planning. It is important that investing institutions are aware of the dangers which excessive dividend

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payments can pose for a company's financial health and long-term prospects. The Government has therefore encouraged companies and financial institutions to develop greater understanding of how longer term and intangible investments help create and sustain good performance by businesses.

The Department's sponsorship of the "UK R&D Scoreboard" (made possible by the introduction of SSAP 13 obliging all companies to report on R&D activities) reflects this view, in informing firms and their financiers about the level of company R&D spend. The Department's involvement in the Cadbury Committee seeks to encourage higher standards of reporting and corporate governance.

6. *Some sectors of UK Industry are more successful in International Markets than others. What contribution does innovation make to their success? what changes in corporate strategy might improve the less successful ones?*

The White Paper stressed the importance of innovation as a factor of competitiveness.

Innovation, in the sense of being the successful exploitation of new ideas, touches upon many aspects of a company's activity. It is influenced, for example, by the availability of finance for investment and R&D; on the availability of the necessary knowledge and skills; on its ability to respond to the changing market; and on the quality of its management.

This management factor is probably the key issue. Awareness of the need to innovate should be present in all aspects of the business, rather than just specific elements of it. Thus, for example, the level of R&D activity within a company, or its access to relevant technologies, clearly have an importance in themselves. But their impact upon the competitiveness of a company depends crucially on its managerial capacity to exploit the potential of those developments. The "Managing in the 90s" programme reflects this philosophy by embracing innovation as an integral aspect in each of its specific subject themes.

A key factor in a company's level of investment in R&D is the attitude of the shareholders. Evidence shows that the explanation of R&D expenditure and other innovation plans to shareholders can have a positive effect. DTI has helped facilitate a dialogue between financiers and industrialists in the engineering sector over the past year, which resulted in the issue of a "Good Disclosure Practice Code" in April 1993.

7. *Which structures and institutions within the UK are particularly helpful in encouraging the process of innovation within a company and which hinder this process?*

The process of innovation is primarily encouraged through the cascade of best practice and experience via people. It requires leadership, continuous improvement, teamworking and customer focus. Successful structures and organisations evolve from this base. DTI sees its role as a catalyst for the process by demonstrating the value of innovation to both firms' "bottom line" and longer term prosperity. To this end, the Department is including an innovation module in the new "Managing in the 90s" Programme and significantly expanding the Innovation Unit—staffed by a mixture of industrial secondees and officials. This will encourage individual regional/local activity and awareness as well as addressing national issues such as developing greater industry/financial sector links and dialogue.

DTI is also developing a network of Business Links which will increasingly become the focal points for bringing together customer driven, public and private sector, business services. Current local technology transfer networks in the UK, of the type that Business Links and firms directly can draw on, are fragmented compared to abroad. The DTI is therefore aiming to stimulate more effective networks, which will be much better able to deliver local access to a supply of technology related advice and services.

Examination of Witnesses

DR ROBINSON, Chief Adviser on Science and Technology, DR DOBBIE, Head of Industrial Competitiveness Division, and DR HICKS, Head of Innovation Policy Division, Department of Trade and Industry, were examined.

Chairman

806. Dr Robinson, Dr Dobbie, Dr Hicks, you are very welcome. Dr Robinson, you will be aware of this Committee's substantial interest in what you are doing; and you are equally aware of our current and long inquiry about the transference from the science base to innovative and competitive technology. We have a number of questions to ask. We will save the

question that we are dying to ask, Dr Robinson, until a little later—it would be unfair to ask you it immediately. We understand that although you have come here you may not be with us for all that much longer. Perhaps we may ask you about that a little later on, unless you want to comment on it now?

(Dr Robinson) I am in your hands, Mr Chairman, in whatever order you like me to answer questions.

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DR ROBINSON,
DR DOBBIE and
DR HICKS

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807. Dr Robinson, you are occupying a very important position in the Department of Trade and Industry and we know that you have been a substantial contributor, but you will be leaving shortly as you have publicly announced, a sadness to a lot of people. Presumably you are able to tell the Committee why. Perhaps you would care to do so?

(Dr Robinson) If I may say a brief word of introduction, Mr Chairman, as you know, Dr Dobbie is Head of our Industrial Competitiveness Division and since our position has been very much to position our thinking on innovation and our relationships with the science base and technology policy, within the context of industrial competitiveness, then it is appropriate for Dr Dobbie to be here to address any issues on that side of it as well. Dr Hicks is Head of our Innovation Policy Division and has been a key player, indeed not just in the past 18 months but for some years now in our innovation policy and our relationships with the science base and in our various schemes, so perhaps you will excuse me from time to time if I ask them to comment.

808. Yes, of course.

(Dr Robinson) The answer to your question, Mr Chairman, is none of the 17 rumours that seem to float around but just a rather simple and pragmatic reason. I gave up my job in IBM about 18 months ago really because I passionately believed that the importance of the whole debate on technology, academia, industry, government, was not well enough represented from an industrial point of view. For a number of years I had relationships with academia and in government. I taught on the Government's Top Management Programme for a number of years on technology and its impact on society and I felt that the whole theme was sufficiently important to be worth thinking whether I could make a difference or not. When therefore I was approached by the DTI about the possibility of taking this post I practised what I have always preached, which is that, if you believe in something strongly enough and think you can do something about it, have a go. I should have to say that the scene now, post the setting up of OST and post the White Paper, is very much one in which I feel much more comfortable as an industrialist. I should like to feel that the change in environment is in some part due to my own contribution, but whether it is or not, it is a radically different environment from what it was 18 months ago: to the extent that I think that one of the key issues is to make sure that industry is taking full advantage of the new environment. Since as I have always made clear to everybody I never saw myself as a life-time civil servant I felt that perhaps it was now not inappropriate to think about the rest of my life, and that is what I am doing. It is nothing more than that. I will not say that I have finished the job, far from it, but the climate is very different and I think that if I have any contribution to make it might just as well be in industry as in the Civil Service.

809. Very good, so that you are of the opinion that the climate now is substantially improved?

(Dr Robinson) Definitely.

810. And you are returning to the climate that you know best?

(Dr Robinson) I spent my life trying to help my old company make money out of science and technology so I have got more experience of that than of being a civil servant.

811. Very well, it is good of you to be so frank with us on that. If I may open the questioning, Dr Robinson, you have already supplied a memorandum to us with a substantial amount of comment both on innovation and on competitiveness. One of the paragraph concludes that how existing technology is exploited and how receptive all areas of a company can be to new ideas and ways of doing business are equally important. The DTI therefore "plan to help demonstrate to UK companies how the yield from R&D spend can be increased through better management of the innovation process". What we should like to know is whether UK companies appear to be reluctant to invest in innovation and what are you going to do to achieve what you set out in that memorandum you said you would achieve? Have you programmes to encourage companies to increase their R and D spend or do you consider this unnecessary? Let us have a view as to how you implement the policy that you set out in that memorandum. Perhaps each of you would care to comment in turn.

(Dr Robinson) First, Mr Chairman, I think that it is probably appropriate to set the broad scene of the policy change of emphasis that we have introduced. As I said in my introductory remarks, I think that the role of the DTI largely in this respect is to increase the competitiveness both of UK companies and of the United Kingdom as a whole, as a country in which companies can flourish. In our evaluation of our policy therefore we very much started from the point of view, "what are the ways in which any action that DTI takes can make a difference either to individual companies or to the competitive environment in which they operate?". The first point that I should like to establish, which may appear slightly off the centre of your investigation but it is none the less very crucial, is to recognise that science and technology in a variety of ways are changing the environment in which industry is operating, be it in things like the creation of the information society, the communications revolution, the concern about the environment and so on. Making sure that our broad policies for industry actually do reflect the way that industry itself and the environment in which it operates is changing with the technology, that, as much as anything, is an internal DTI awareness raising process, as well as communication to the outside world. The second of our major thrusts relates more directly to some of the points that you raised, Mr Chairman, that is, facilitating the climate for innovation. There is a range of activities that we indulge in, all of which are of the form of trying to raise awareness and spread best practice about the range of science and technology issues. From our memorandum and one hopes from other sources, you are familiar with the Innovation Unit which we created a number of years ago, which has heavy interaction with the outside world on raising companies' awareness of the innovation process in a variety of ways. The R&D scoreboard is

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one thing that we produced. More recently we have been trying to stimulate a dialogue between industry and the City about the importance of R&D. We have been facilitating, in a number of places round the country, local efforts to stimulate innovation networks, innovation sharing and industry relationships in the local community. That part of our activity therefore is very much one of networking, creating awareness, spreading best practice. As a follow on from that we have recognised, and it came out of some of Dr Dobbie's work on competitiveness, the importance of spreading best practice on a range of management issues across British companies. We recognise that leading British companies can hold their own with any around the world, but as a nation we can only be successful if we can raise the general level of our competitiveness throughout large and small companies and throughout the nation. So we have been rethinking our processes emphasising best practice under the "Managing in the 90s" programme. We recently agreed with the CBI, and which they announced at their conference recently, that we will be working with the CBI's National Manufacturing Council who themselves have been looking at competitiveness on how jointly we can support best practice programmes throughout industry. The National Manufacturing Council, as you know, includes a number of leading British companies who are themselves keen to spread the best practice programme. So the thrust into best practice is a move that we will not only be developing ourselves, but also jointly with the CBI. The third part of our overall approach is in the general area of the standards and regulatory infrastructure within which industry operates. The regulatory standards environment can be both a facilitator and an inhibitor of innovation. On one side this brings us into the deregulation initiative, with which obviously you will be familiar, Mr Chairman. But in our own area it has caused us, for example, to carry out the review of the standard setting process that BSI does and whether it is meeting the needs of modern industry into the future. That activity can make a fundamental difference to industry's competitiveness. The fourth of our major areas, we put under the heading of "technology access". If I may make one observation that members of the Committee may wish to take up later, there is a lot of focus these days quite rightly on technology transfer. We have been, while fully endorsing that, trying also to get people to think of it, not just as a transfer of technology from the people who produce it to those who need it, but actually identifying those who need it and help them go and get it. So we prefer to use words like "technology access" or "technology adaptation" or "technology application" because it emphasises the point that, in the end, it is the people who are going to use the technology who should be driving the process. We have a range of our existing activities where we are re-emphasising the new things that we are doing in dialogue with people under that general heading. As one or two examples that you may wish to pick up on, Mr Chairman, we created the Overseas Technology Brokerage Service, we are working with Business Links and with the TECs to identify what capability might be needed for local innovation services. We are working with colleagues in

government departments to emphasise the importance of the Teaching Company Scheme as a mechanism that links industry into possible sources of capability in the universities and so on. Thus there are a range of programmes that exist and ones we are in consultation about. Fifthly, we have the area of the development of technology. This is an area that obviously has a lot of focus from people in the need for support and development of new technology. We established fairly early on in our activity that while DTI could play a role in stimulating and encouraging the development of technology we subscribe to the generally held view that a major problem that we have in the United Kingdom is more on the use of exploitation, hence our shift of emphasis. However, in the area of encouraging the development of technology we have focused our efforts on getting greater value out of technology programmes that are already supported by other people, programmes like LINK, like EUREKA, like the Framework programmes, and have engaged in dialogue with other government departments as to how industry can play a more substantial role in their own research and development programmes so that the taxpayer is getting better value for money. We are pleased with some of the progress that we have made in those discussions. That is the broad range, Mr Chairman.

812. Thank you for that broad range. Does Dr Hicks wish to add anything?

(Dr Hicks) I think that it is worth noting, of course, Mr Chairman, that in all of this we are working very closely with partners in other parts of government and beyond government. Dr Robinson has spelt out that whole range of activity, but in fulfilling all those areas we should work closely with the CBI, with the learned societies and with the institutions, including engineering institutions, the research councils, the Office of Science and Technology and other government departments, and one could go on and on. A whole range of things that DTI is engaged in has to be seen against what other players are engaged in, including of course activities which flow from the European Community level and the international backcloth which was referred to by Dr Robinson.

813. And they welcomed this initiative?

(Dr Hicks) We have found that this whole range of bodies has very much welcomed this initiative. The Innovation Unit in particular has undertaken a great deal of activity in the regions around the country which has gained very little publicity nationally but has been forming alliances between quite unusual partners, local authorities and financial people in localities. That set of activities, of course, Mr Chairman, is aimed at changing the culture, changing the climate for innovation, and that is much better done where the people are down, than the centre. So we are putting the secondees, who are working with us, out into the regions for the most part.

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Dr Williams

814. Dr Robinson, in the earlier question about your career move you more or less said that during your time at the Department of Trade and Industry there had been so many changes now that it is mission accomplished as far as you are concerned and you are leaving it in very good, positive hands. I do hope very much that that is the case. I spent the afternoon reading through the submissions that you have made to us as a Committee and generally I must say that I found it quite depressing reading, especially when we make international comparisons. The Committee a few weeks ago spent a few days in Japan visiting a number of top industrial establishments, government departments and so on, and were considerably impressed by the great emphasis on research and development. Why is it that in comparison to Germany and our industrial competitors, and in particular Japan, our companies are not investing on the same scale but a full 1 per cent of GDP below our international competitors?

(Dr Robinson) There are a number of questions in there that Dr Dobbie may care to comment on in respect of international comparisons in general, but perhaps I may make one or two observations, Mr Chairman. First, I think that the broad flavour of international comparisons is that the government spending on research and development in the United Kingdom is broadly in line with the percentage of GDP of other countries. There are differences of pattern as between military and civil areas as you no doubt realise. In so far as we have an issue, it is in the area of spending by individual companies. There are a number of explanations that have been given for this from various sources. The first is in terms of potential differences between different sectoral make-ups of the economy. There are some sectors of the economy that are inherently more research and development intensive than others. A more likely cause is sometimes ascribed to the uncertainty of economic climate that this country has had for many, many years. Even others subscribe to the view that we have an anti-industrialist and anti-technology culture in the United Kingdom. In response to all those, I should say that, in so far as our standing has been lower, there are beginning to be encouraging signs. There have been increases in private spending. You may know from our own R&D Scoreboard that we recognise a 6 per cent increase in industry's funding in research and development by United Kingdom companies. The CBI survey has indicated that their members have not been cutting down in R&D investment in the recession and the improving level of recognition in the City of the importance of companies investing in R&D we should regard as a very good sign. All those indicate, as we should hope, a start to increasing expenditure. Having said all that, Mr Chairman, I should just draw the attention of the Committee—not in any way to avoid the observation—to the fact that in the end what counts is the benefit and results that companies get from that expenditure. One of the strategic trends that one does see around the world, including in Japan, is companies looking much harder at the value that they are getting out of their research and development expenditure.

From my own conversations with companies, UK industry has been going through that process quite aggressively over the last few years, just looking at the value that they are getting out of it and trying to increase the value that they get out of research and development expenditure. If I may go back to the chairman's introductory remarks part of what we are trying to do is to encourage and to stimulate that debate not just about the level of research and development expenditure but actually how to get more value out of it—even in our own area, for example, "Have you thought of the fact that 30 per cent of the ideas that go to the Patent Office already exist and, if only you had asked first, we could have told you that already existed". Not to deny the fact that UK companies do appear to spend less, there are some reasons that might account for it. There are some encouraging signs that the issue is well recognised, but I should have to say—and I could comment at greater length if you wish from my own experience—that wherever you go now you will see companies looking much harder at the value that they are getting out of it, having been through all the process of cutting back on manufacturing costs and cutting back on marketing and on administration costs.

Chairman: I am bound to say, Dr Robinson, that if it were possible we might ask you to keep your remarks a little shorter because we have a number of questions to ask.

Mr Batiste

815. There are two specific points arising out of what you have said, Dr Robinson. The first is that it has been put to us, on a number of occasions, that the lack of consistent low inflation in the United Kingdom and as a consequence the fluctuating rates of the cost of capital has made it particularly difficult for UK companies to invest long term in research and development. Would you accept that there is a correlation in the level of R and D spend by companies and the success of those economies in keeping inflation consistently low through the years?

(Dr Robinson) On that question, Mr Chairman, I think that I should very much bow to Dr Dobbie, who has made a study of this whole area.

(Dr Dobbie) Mr Chairman, I think that the evidence from international comparisons is that the most volatile economies have not necessarily been the least successful. If we look at Italy, for example, over the past 30 years it has been the most volatile of the G7 economies across a wide range of variations of the macroeconomy on growth, on interest rates and on inflation rates. Taking a weighted average then we can see that Italy has been the most volatile, yet Italy has grown substantially faster than the United Kingdom and, indeed, than France and Germany over the past 30 years, so I should say that it is not necessarily true that stability determines economic progress.

816. I was not putting the question in the context of economic progress generally, but I was asking more specifically in the context of R and D by companies.

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(*Dr Dobbie*) R&D spend by companies is aimed, however, I should say, at economic progress and at faster development. Italy is a case in point where in the 1960s and 1970s UK companies spent a higher proportion of GDP on R&D than did Italian ones. So it comes back to Dr Robinson's point. It is not just necessary to carry out the research and development but it is a question of exploiting the technology in the market place. There the Italians have been successful despite an unstable macroeconomy.

817. The second point that has been put to us is that in the United Kingdom in looking at the engineering industry specifically rather than the pharmaceutical industry the manufacturing process as such is less effectively integrated into the international benchmarking and the R and D process. The industrial managers in Japan will be part of the R and D teams at a very early stage. As a consequence both the take up of ideas and the industrial quality in the production of the product from those ideas is significantly more advanced. Would that be a fair perception?

(*Dr Dobbie*) I should say that that was a fair perception, Mr Chairman. In Japan managers tend to be trained on the job, having been hired as engineers, and the proportion of engineering graduates is rather higher in Japan than it is in the West. These engineers tend to move around from post to post covering marketing, sales, production, as well as R&D, and I think that that does develop a perception of the company's overall performance which is hard to emulate unless a similar process of developing a wide range of skills in managers, especially in engineers, is carried out. There are of course techniques that we are using in the United Kingdom to try to develop that, such as the Teaching Company Scheme, and my colleagues might like to comment on that, and the Post-graduate Training Partnerships Scheme, but we are some way behind.

Chairman: Thank you, there will be other questions on education coming up.

Cheryl Gillan

818. I just want to take you back to where you were talking about value for money and the effectiveness of the DTI spend because I wondered whether you would care to comment about the substantial reduction in the DTI spend which is evidenced in the Red Book. At a time when defence expenditure is being reduced and the OST input is remaining level I wondered whether you are satisfied that the reductions in the DTI spend are not going to damage the research and development as it relates to industry. Further, I just wondered whether you would care to comment on the two new programmes that the President of the Board of Trade announced in his speech yesterday on the budget, namely, the £16 million joint environmental technology best practice programme which you were talking about and the new co-operation with SERC, the £10 million LINK programme?

(*Dr Robinson*) First, Mr Chairman, as the President of the Board of Trade said in his speech yesterday, the

significant reduction in DTI expenditure over 14 years is largely as a result of the nationalised industry contribution moving out.

819. But that is two thirds of the budget for the next four years.

(*Dr Robinson*) Indeed so, and I think in terms of the contribution that that expenditure was making in terms of research and development expenditure it is not a factor that is relevant to this discussion that we are in today. On the two programmes that you mentioned I think that they are both very good examples of the policy emphasis that I have described. You mentioned the environmental technology best practice programme. You may not have had a chance to read all the details about it yet, but there are elements in it that are key to the policy issue that we are discussing. It is a collaborative programme between DTI and DoE to the benefit of both sides. It is aimed at improving environmental monitoring control and best practice, but it is aimed also at helping those industries that are beginning to make money out of environment technologies as an industry in their own right. Therefore, the range of policy options that we cover with it is quite important. That is one of our themes wherever we have any programme expenditure to make sure that we get the maximum benefit out of it. On the LINK programme, again as I stressed in my introduction, our objective is to make sure that our expenditure can leverage, if you will excuse the American word, the expenditure and skills and capabilities of other organisations, and that is what we do, through LINK, with the Research Councils. In that sense I think that both programmes are fully in line with our policy and with the White Paper.

Mr Powell

820. How confident are you that UK industry is going to be able to grasp the opportunities that now exist as a result of the sharpening of the focus of national research towards wealth creation or to what extent do you think that the sharpening of the focus may benefit non-UK companies resident in the United Kingdom to a greater extent than the UK-owned companies themselves?

(*Dr Robinson*) In my answer to the second part, Mr Chairman, you will be aware that I am returning to IBM so you may care to ask my colleagues for their views on that question. The government policy is very much one of support for inward investors and they are treated exactly the same as all the UK-owned resident companies. How confident am I that UK industry will grasp the opportunities? I should have to say a significant degree more confident than I should have been two years ago or than I expected to be two years ago. I think that the reaction to the White Paper and the change of emphasis of government overall policies has been outstandingly positive by industry. I continue to be mildly but pleasantly surprised how keen industry is to take advantage. In there I think that there are some key things that we have to recognise, not the least of which is that in establishing links between academia and industry we need to understand the constraints

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under which industry has to operate, constraints of time, responsiveness, focus and so on. So we might need to adapt some of our mechanisms for industry to take full advantage, but, based on the reaction so far, I am extremely confident.

Dr Bray

821. Dr Robinson, the broad tenor of the replies that you have given is that the long-term trends and underlying situation in competitiveness are well known and much discussed, that the Government has made some changes set out in the recent White Paper and that perhaps time is needed to see how this works, but you are confident that the effect has been positive. I wonder whether that does not amount to re-winning the last war. May I draw your attention to chart five of the memorandum that you submitted to the Select Committee on Trade and Industry on rates of growth of GDP where there is a clear group of countries—Hong Kong, China, Korea, Taiwan, Singapore—up in the top right-hand corner with rates of growth and another group of companies in the bottom left-hand corner, with the United Kingdom at the bottom, with lower rates of growth in exports. These are indeed borne out by more recent figures than appear in this memorandum. Has the policy of the Government been at all orientated at the situation that you know so well, that if you are setting up a production line in electronic components it is as quick and as high quality to do so in a suburb of Shanghai as it is in Scotland or Wiltshire?

(Dr Robinson) I will ask Dr Dobbie to comment on the chart, Mr Chairman, because it comes out of his work and he has discussed it with the Select Committee on Trade and Industry, and then I will comment if you like on the competitiveness of manufacturing.

(Dr Dobbie) In response to Dr Bray, Mr Chairman, the chart displays the very rapid growth that these newly industrialised companies have achieved over a substantial period, over the last full economic cycle. None of the developed economies, even Japan, has quite managed to achieve that rate of growth. Most of the economies shown in the NICs (Newly Industrialised Countries) have an income, a GDP per head, which is substantially below that of the western countries. Their productivity levels are not as high as ours, but they are increasing towards ours, that is to say, their performance is not fully equivalent to that in the West. With regard to some measures such as productivity versus wage costs it is still economic to carry out activities in the West rather than in the NICs, but there is no doubt that the newly industrialised companies represent both a threat and an opportunity. The threat is that they will produce products that our companies cannot produce at equivalent levels of cost. The opportunity is that in their markets, and perhaps especially China is a good example of that, 1.3 billion people, it is now the second biggest economy in the world when you take account of purchasing power parity, bigger than Japan. There is an enormous opportunity there for capital goods from the United Kingdom and other western countries and, provided our economy is competitive, we should be able to satisfy at least some of that market. For example, in power

stations, in the metro systems, in telecommunications networks they are building up. We see examples of that over recent years and I believe that we will see many more in the next few years.

(Dr Robinson) You made the point about comparing the manufacturing line in the United Kingdom with that in the Far East. I think the point is well recognised that manufacturing these days is less and less about unit labour costs and more and more about added value, innovation, speed and responsiveness. In that sense, the threat from the Far East is at least as much in those terms as it is in terms of labour costs. The United Kingdom will succeed to the extent to which it responds to those challenges of individual companies. The point about our own stance in the White Paper is that changes are quite radical in respect of bringing the full weight of UK innovation in the science base into a form where UK companies are more likely to tap on that great source of strength to improve their innovation and products. They have to compete on that basis.

822. Are you satisfied that that is fully taken account of in the Government's policy? It does seem to me that a great deal of the inward investment policy and a great deal of the concept of transfer from the science base into industry and so on all works just as effectively nowadays in Kanton or Tian as they do in Livingston?

(Dr Robinson) Mr Chairman, I should have to say that I have no reason whatsoever to believe that our policies are not sufficient. As was indicated in the earlier question, the challenge is on industry to exploit the possibility and to seize the challenges. I suggest, if I may, that the challenge is also on our academic colleagues to recognise that, unless we can improve that partnership, the United Kingdom's undoubted talent will not be brought to the front edge of the competition as it needs to be.

823. As an example there is today and tomorrow a discussion meeting at the Royal Society on mathematical and statistical aspects of DNA and protein sequence analysis where the science base is as good as anywhere in the world. Out of some 150 people attending only seven are from industry and there is nobody there from DTI. If we are going to get effective transfer on a world competitive basis at the speed at which things move in these areas is that a satisfactory picture of the relationships and attitudes of industry and of Government?

(Dr Robinson) I have made the point on a number of occasions, Mr Chairman, that we should read a different significance into the fact that there are many public meetings where the science base and Government is very heavily represented but industry is not as well represented. One could read into that that industry is not interested; one could also read into it that industry actually is extremely pressed with its talented people in industry today and we need to think how our mechanisms for academic-industry-government relationship and dialogue can take that factor into account.

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Chairman

824. May we take that a little bit further, Dr Robinson, because in the memorandum that you sent us you evince the fact that government policy should be directed very broadly in just that area, to ensure that UK plc was persuaded that it should be utilising not only the technological resources but the academic resources that are available. Have the policy initiatives that you have described earlier given you confidence that that is in fact improving the world competitive standard? If I may say so, your comparison with the Italian position was a fairly woeful one in relation to the United Kingdom?

(Dr Robinson) As far as the government policies are concerned I see no reason why they are not sufficient to set the climate that is needed. I do feel quite strongly that there is still the challenge of completing that binding of mutual understanding and partnership, hence my statements about my own role in industry. I also feel that in order fully to cement that partnership we need to understand that the relationship between academia and industry requires a mutual coming together, not one where academics are led to be able to say that "industry just does not take advantage of what we do". Starting with the Technology Foresight Programme, and with industrialists on the Research Councils, we are creating a whole structure that helps to bring those two communities together in a meaningful and in-depth relationship. In that sense I am fully satisfied with the policies.

Mr Batiste

825. Mr Chairman, if I may follow on really from this point about the relationships between industry and academia one of the curious things that struck us on the visit to Japan was that while they were producing something like three times or more qualified engineers from their system than we were we produced more physicists and chemists, and they were astonished that we produced as many as we did. I wonder whether part of the problem is that the mix of scientists that we have within our science base in academia is more focused towards the area of blue sky research and curiosity driven research whereas in Japan that was virtually non-existence in the academic world and the problem inherently is that we are trying to get academia to look in two different directions at the same time and it is the mechanisms for managing that in relation to industry that seem to be the problem?

(Dr Robinson) I think that I should preface my answer by saying that the climate in academia is very different from what it was ten years ago. I have had a number of very encouraging sessions with academics where they are trying to make this bridge. On the point about scientists versus engineers I have to confess that I am a mathematician so I preface it with that. My colleagues are both chemists. There is a tendency, I think, not just in academia but in industry to have a sort of intellectual pecking order that says the more theoretical you are the better it is down to the more practical you are the lower status it is. In practice I think that there are encouraging signs that that too is beginning to change. As you may know, something like

half of our vice-chancellors at universities are now engineers by background and that is very positive itself in starting to create that right sense of worth.

Chairman: Let us talk then about education in a little more depth.

Mrs Campbell

826. Dr Robinson, I should just like to take up with you what you see as the ideal relationship between higher education institutions and industry. I think we have had a great deal of evidence about the amount of interaction that has taken place. Although a lot of this is encouraging and one can pick up some very good examples of the way it is working a lot of it does seem to be very ad hoc in that industries do not always have a clear idea where to go for the best academic advice. It may not be their nearest university. I think in your DTI memorandum you have actually mentioned the role of one stop shops in helping clients to gain access, but really I think that I want to explore with you is whether you feel that universities should be exploiting their science base by rigorously controlling the intellectual property rights and trying to make as much money out of it as they can or whether they should be much more open to industry, encouraging them to come to them for advice and forming a relationship that perhaps is less cash based and more agreement based.

(Dr Robinson) The short answer, I think, Mr Chairman, is that we should like to encourage all forms of relationships that make sense to the partners involved. More specifically you are probably aware that DTI has sponsored a couple of programmes with universities recently; support for industrial units and Technology Audits, which have been very well received by universities who see it as a very conscious and positive contribution to improving their relationships with industry. The point that I should like to stress quite hard is that when we think of academic-industry relationships there is a tendency to think in terms of the extreme high research end of the spectrum through programmes like LINK, the Research Councils and so on. At least as much, we have been trying to encourage the local relationships between industry and their universities, and hence what we are doing with the Business Links and the TECs and the Teaching Company Scheme to try to broaden that relationship. As it happens, I was at Strathclyde University on Monday evening giving a lecture on this whole subject and I challenged them with the very question that you challenge me with: "is it right for universities to try to protect their intellectual property because, in that way, they might build a barrier between themselves and industry?" Their response was that they are fully aware of that and do whatever makes sense in the circumstances and have managed to find the right relationships with industry for the project they are involved in. Wherever I look I see that encouraging sign of a mature relationship between both partners.

827. How do you see Government actually intervening in this? Do you see no role for Government at all in trying to increase that amount of interaction or is it purely by exhortation or what?

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(Dr Robinson) There are a number of ways, I think, in which Government is involved. There are obviously some issues for the Department for Education that are not directly for me to comment on. As regards technology, of course, I have already alluded to this and as regards what we are trying to do with stimulating those connections through LINK and Industrial Liaison Units, I think that there is quite a positive role for Government. I do think it is one of enabling, information, network building, to find the right relationship between industry and the universities. I do not think that we can actually go and pick which partnerships should be established. At every university I go to I think that it is going on quite a lot.

Mr Batiste

828. Dr Robinson, you have spoken this afternoon about the positive way that progress has been made recently and the new climate and you spoke of 50 per cent of the vice-chancellors being science disciplines, yet in the memorandum you say "there is considerable room for improving the effectiveness of these technology transfer mechanisms and increasing the general interaction between the science and engineering base and industry in the UK". What I think we should like to hear is your perceptions of the current difficulties standing in the way of that relationship.

(Dr Robinson) Mr Chairman, I think I should have to say that the biggest single area of difficulty is probably still ignorance. The examples that we talked about have been universities or companies who are at the leading edge of this partnership development. I have also talked in terms of our policies all being aimed at enabling and facilitating. But I think that we should recognise that there are still large parts of industry where they do not know how and in what way they should best relate to universities. Hence we have been trying to create this whole set of options from Technology Foresight through to Business Links, and there is still quite a selling job to be done on all that. The Technology Foresight Programme has made a lot of strides forward in the last three months and has started to create that awareness. The TECs are now getting very enthusiastic about doing things at the local level. There is still a lot left to deliver.

829. Do you see any structural barriers?

(Dr Robinson) My colleagues may comment, Mr Chairman, but I am not sure that I do see a structural barrier. I think that the White Paper has clarified a lot of issues and I am not sure that I do see a structural barrier. My colleagues may like to comment.

(Dr Dobbie) I see no structural barrier, Mr Chairman. I see an information barrier.

Chairman

830. An ignorance problem?

(Dr Dobbie) Yes, Mr Chairman, both at the demand and at the supply side. I think that some of the higher education institutes are also not as proactive as one would hope in going out and devising their own research programmes to relate to possible industrial

interest and even in selling their services on a short-term basis although I do think that the change is quite dramatic. I was an academic until 1976 and when I speak to my former colleagues at Newcastle University I do not recognise the picture that they give me now of the interactions that they have with companies and industry: it has changed enormously.

(Dr Hicks) What we see, Mr Chairman, is the demand side/supply side difference. We find it very easy to devise policies and activities which are going to build up the supply side. You might say that there is a lot of demand from the supply side for us to assist them in going out and presenting their wares to industry, and a number of the mechanisms that we have used in the past quite successfully have dealt with that. But if the demand side is not there the success is going to be relatively limited. To change the demand side is much more difficult and requires a lot more detailed operation. The kind of measures that we have been talking about through the Innovation Unit and the kind of measure through the involvement in the Foresight Programme are the kinds of measures that we think are needed to change the demand side.

831. May I move now to a quick question that you may want to respond to in writing. Are there now sufficient case studies available of cause and effect which show persuasively that the kind of policy that you are pursuing can be sold better to industry? Do you have a good series of case studies now?

(Dr Hicks) We evaluate our policies. If you look at the back of our annual report there is a whole series of evaluations quoted. From that we have been able to draw general lessons about technology transfer, mechanisms which work and those which do not.

832. And that is persuasive to your potential customer?

(Dr Hicks) It is persuasive to us in setting up the kind of policies that we think will change the market out there for technology.

Chairman: Very good, thank you.

Lynne Jones

833. In what way have you changed your policies based on that experience? It has been suggested to us that many firms have commented about bureaucracy and getting involved with DTI schemes and the requirement of companies to put a lot of investment in themselves may put them off. If we look at the figures for schemes such as LINK and other schemes the budget seems to have gone down quite dramatically from 1991-92. Is that because of a budget reduction or a lack of take-up and, if the latter, how are you addressing it?

(Dr Hicks) There are two separate issues there, Mr Chairman. The first part I was addressing was technology transfer. There are a number of features in which we have changed our policies, and Dr Robinson may want to come in after I have finished this to amplify. One of the key things has been our move from an attempt to promote nationally to our attempt to get change done locally, and we have seen far more

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success, for example, in creating best practice activities locally and using local drivers rather than trying to send our messages from the centre. So that is one feature, Mr Chairman. You asked about LINK. I think that your question is on a false premise. Our expenditure on LINK has risen every year since the scheme started.

Mr Williams: Perhaps I may just ask this specifically on that, Mr Chairman. In the handout that you provided for us, I noticed that in the major LINK projects there was not anything from September 1991 to April 1993: there is a hole there. Can you tell us why there was no major project in the LINK scheme here?

Chairman

834. We might pursue this separately, I think, otherwise we are going to get in a muddle.

(*Dr Robinson*) We will send you a letter with all the full details, Mr Chairman.

835. If Mr Williams could hand over the document perhaps you can correct it for the record if you believe that it is inaccurate.

(*Dr Robinson*) May I just make one final brief comment here on evidence. I should commend to you a report that was put out by the ESRC—the Economic and Social Research Council—last week, the headline of which was, “Collaboration with academics increases dramatically”. It is a survey of papers published and the changing pattern of how more and more papers are now being published by companies and by companies jointly with academics. I think that that is a very encouraging sign about the way ahead.

Chairman: Thank you.

Sir Trevor Skeet

836. Dr Robinson, I have been rather impressed by the LINK programme for technology transfer. You have 34 projects in operation. But I am also impressed by another document that you have given us about gross expenditure on research and development, and this is chart No 3, a vast expenditure by the Americans and Japanese and a tiny expenditure by the United Kingdom. You happened to observe earlier that some money probably was not well spent. If that is your explanation of this then as an industrialist are you satisfied with the result?

(*Dr Robinson*) Would you refresh my mind with the chart, please?

Chairman: It was submitted to the Select Committee on Trade and Industry and thus circulated to ourselves.

Sir Trevor Skeet

837. That is correct.

(*Dr Robinson*) Again perhaps Dr Dobbie would like to comment as this came out of the work that he did with the Trade and Industry Committee.

(*Dr Dobbie*) Mr Chairman, the chart indeed shows much heavier expenditure, for example, in the United States than in the United Kingdom.

838. And Japan?

(*Dr Dobbie*) Yes, and it mainly reflects in the case of Japan very heavy expenditure by business. As you undoubtedly discovered when you went to Japan the level of expenditure by Government is low. So that, I think, takes us back to where we began this afternoon and your comments about the low level of expenditure by firms, in the United Kingdom and our concern about that. That is perhaps the story that lies behind this chart No 3.

839. Yes, and now you are trying to correct this interaction between industry and the science base. Do you think that there are any defects in the system of LINK and the system that you have got of claiming back from companies which have been successful, this is not a Japanese method of doing it—they charge a higher rate? Do you think that the LINK programme should be modified to be more effective?

(*Dr Robinson*) Mr Chairman, I think that there are two points in there. One is the question as to whether Government should claim back money that it has given in the forms of grants, and Dr Hicks may like to comment on that from his own experience when we used to do that. The second is really the question, “do we think that we have the right balance between what industry is funding for itself, what Government are funding in the science base or other government departments, and the mechanisms for trying to get more industry value out of those government-funded programmes?” If I have any concern in that set of issues it is largely one of the concern that has been expressed by members of the Committee and by myself as to whether industry really is investing enough in its own research and development, completely independent of government activity, for long-term success. But as to government expenditure or links between the science base and industry, no, I do not have any fundamental concerns there.

840. Then as one final point on this, Mr Chairman, this programme has been running for several years.

(*Dr Robinson*) The LINK programme?

841. Yes. You have now currently 34 projects which are operating. Should we not have expected better results over the years?

(*Dr Robinson*) I think that we have been going through the process of assessing the value that we get out of LINK. I think that we have come to the conclusion firstly that for a variety of reasons, including LINK, we have changed the culture of collaboration. In so far as LINK was a programme primarily aimed at establishing the culture of collaboration we have been wonderfully successful. Now what we are doing with our colleagues in OST and other government departments is saying, “how should we now take the LINK programme forward?”. Our interest is in spreading that habit of collaboration to companies or sectors or even academic departments that have got no history of collaboration, so we can spread the good message to them; and I think that we have been successful.

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Cheryl Gillan

842. What percentage of our organisations do you feel have not yet been reached by the LINK?

(Dr Robinson) The answer as far as total organisations are concerned is obviously very high when you include all companies. In respect of organisations that we think could benefit from LINK itself we should estimate probably that still the vast majority of companies yet remain to be reached. I am not sure, Mr Chairman, that I should like to give an estimate as to what that would be. However, I should just add that the companies for whom LINK itself is an ideal mechanism are probably relatively small in number because by definition with LINK we are talking about leading edge research. Our focus now is on identifying small, high technology companies that have not yet got the collaboration habit with universities. I should just stress that there are lots of other collaborative programmes—the Teaching Company Scheme, EUREKA and so on—which may be more appropriate for many companies than LINK.

843. So, Dr Robinson, just let me make this clear. Are you recommending that we should increase our spend on this area? Do you think that it would be beneficial to increase the spend on this area or is there only a certain amount of success that you can have and therefore a steady trickle in the way that we are doing or would you like to see a boost in this area? I know the Surface Engineering programme was obviously something you were pressing for, but have you got more ideas in the pipeline that you are unable to pursue because of funding?

(Dr Robinson) By definition, and rightly so, there are always far more ideas than can be funded. I should be very worried if that was not the case, Mr Chairman. As to our own policies, we have established a model that says that within the totality of our spending the current proportion that we give to LINK we think is about right, that is, within the totality. There are lots of other things against which we have got to apply our money and I have indicated some of those this afternoon. However, we think that the proportion in LINK is about right.

Lynne Jones

844. Mr Chairman, I am rather confused now about the resources that are going into LINK. I have here in front of me the Trade and Industry Expenditure Plans which suggest that for new programmes under LINK and a number of other schemes in 1991-92 the outturn was £74 million, in 1992-93, £30 million and planned for 1993-94 £30 million.

(Dr Hicks) What we have got here, I think, is the difference between the announcement of programmes, which is one table, and we did not announce any new programmes in 1992, and the start of new projects, and table 13 in our annual report reports those numbers, and expenditure which flows.

845. Yes, obviously you have carry-over from the previous projects and that indicates that in terms of keeping it going—

(Dr Hicks) Speaking from memory the figures we have spent on LINK over the past few years have run £4 million, £7 million, £10 million and £15 million, that is last year.

(Dr Robinson) That is cash or cash handed on.

(Dr Hicks) Cash which DTI has paid to projects when claims have come in to pay the money. That is a very large sum. What we have to do is to phase the announcement of new programmes such that we can contain the LINK expenditure when the cash call comes within the actual provision. In 1988-89 what we found was that there was a relatively lower demand for LINK and we had difficulty getting new programmes going. Around 1990-91 we found that there was an increasing demand and more people wanted to run programmes than we had expected, and at a higher level. We announced probably a higher level of programmes in 1991 than we should have done to have been able to accommodate it within our long-run programme, and some of those programmes, as you can see, Mr Chairman, were announced at the end of 1990 and then running into 1991. There was one very large programme announced in September 1991 for £20 million, shared between the partners, the largest LINK programme ever. We had no hesitation in the new programmes that we announced to bring the expenditure back to something that was actually achievable so that we had an exponential growth in the amount of cash going out the door. This year with the programme that was announced yesterday by the President of the Board of Trade we will have announced five new LINK programmes and our expectation is that the level of spend will level out above that £15 million, around that sort of level, somewhere about £15 million, £20 million per annum, and we have to bring in replacement programmes and projects, selecting them from a wide range of applications and a wide range of possibilities so that we get the best effect.

846. So that there is a high demand from companies to take part in this programme? I presume that there is no shortage of demand from funds that are available. Would you say that you are turning down potentially valuable projects because of inadequacies in the budget?

(Dr Hicks) Dr Robinson has already said that it would be disappointing if we did not have to select the good from the good.

Chairman

847. So there is over-demand but you can manage a steady increase in the number of companies over time who can benefit from LINK?

(Dr Hicks) In the terms in which you put that, Mr Chairman, yes. We should expect to have a number of programmes that level out within a fixed budget.

Mr Miller

848. If therefore you look at the figures that I understand Alan Williams passed you back from your department some are projects that are in fact completed now—this is total expenditure—and the one you

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referred to of September 1991, enhanced engineering materials, a £20 million programme over five years is quite a big programme, but I think what we are trying to pin down is what is the actual spend this year, that is, projected this year, as compared with last year?

(Dr Hicks) I suspect it to be round £15 million, Mr Chairman, and it is roughly levelling out at that.

849. And that was the same last year?

(Dr Hicks) Yes, that is right.

850. So there is no new LINK money?

(Dr Hicks) We expect LINK expenditure to be levelling out somewhere between £15 million and £20 million a year. It is difficult to project at this point what we should spend in a year because we may have a big claim in or we may not and it could fluctuate from year to year, but that is our projection.

851. But there is not a £10 million increase on the expenditure over last year on LINK projects?

(Dr Hicks) I did not say that there was.

852. This is a new project, the one that the President of the Board of Trade was referring to yesterday?

(Dr Hicks) The programme that was announced yesterday is a programme where we will now invite applications. Those applications will come in and will be selected. Projects will start some time during next year, some of them not for two years, as applications come in. When the projects start then people put in their claims and we will still be spending money on that programme in five years' time.

853. As part of that rolling budget?

(Dr Hicks) Yes, so that £10 million expenditure, which is to be a £10 million expenditure by industry, SERC—

854. — will add to your £426 million total commitment since 1988?

(Dr Hicks) Yes.

855. By a sum of £10 million, but as far as annual spend is concerned it will not in fact increase this year's annual spend?

(Dr Robinson) Not this year's, no. It will push that £15 million, £20 million out to the future.

(Dr Hicks) It is in our planning figure for the future.

Sir Gerard Vaughan

856. On this Committee we spend a good deal of time looking at the sources of money but also at the sources of financial advice. For example, in Japan they have a long-term investment fund which they can draw on. Here we do not. In Japan and in Germany and to a lesser extent in the States they bring in financial interest very early on in the research and innovation process. Here we do not. Dr Robinson, you referred to talks with the City, but you did not say that there had been any outcome of those. Dr Hicks when talking about the LINK programme mentioned financial advice as one of

the bits of the programme. In respect of two of the regional meetings that I have inquired into in neither of them were there any banking people at all. It may be that those are the exceptions—I do not know—but I specifically inquired about this. Now there are four or five questions tucked in there. I do not know which ones you would like to comment on, Dr Robinson.

(Dr Robinson) Mr Chairman, perhaps I may ask Dr Dobbie to comment in general about the whole question of relationship with City and finance because it is a broader issue than just research and development. In the first instance perhaps I may just make the observation that I think that it is still true that the links of understanding that we have between our research and science and technology and engineering community and financial interests are not as strong as they should be. I think that it is easy to blame "the City" and it is fashionable to blame the City, but I believe that we all have something of a responsibility to make sure that all parties involved in that debate are trying to improve those relationships. I can comment specifically on what we are trying to do in the local initiatives with our Business Link type process, which is to recognise that successful financial investments in relatively small enterprises are only ever going to be successful if people know something about the enterprise in which they are investing. That is the only way that you have of lowering the risk in a small enterprise. The theme that we are trying to do with our Business Link support is to bring a technology counsellor into the Business Link who can give advice on technology in a business context; at the same time the Business Links are also tied into local sources of financial advice, so the trio of things—technology advice, business advice and financial advice—can come together. I do not know whether Dr Dobbie wants to comment.

857. That is not, as I understand it, what they do in the best and most successful areas in Japan or in Germany and it is not what is happening in the LINK meetings that I have heard about. There were no banking people there at all in the strict sense. Is that because you do not think that they are necessary?

(Dr Robinson) No, it is not because I do not think that they are necessary. I cannot comment on the particular meetings that you went to. The point that I was establishing, or that I was trying to establish, Mr Chairman, was that through the Business Link community in a local environment we should be able to draw in the financial capabilities of that local community and we should hope that the local community would get involved in that.

(Dr Hicks) Mr Chairman, last week I spoke at a seminar organised by the National Westminster Bank on technology and management. That was jointly sponsored by them and myself and a number of colleagues from the public sector and from the private sector where we were speaking about technology. So the banks are involved. Indeed, I was seconded myself to Barclays Bank for 18 months in the 1980s.

858. The banks may well be involved nationally, but they do not seem to be involved locally.

(Dr Robinson) I do not think that I am in a position to argue . . .

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Sir Gerard Vaughan: I think that they should be. We are asking for your advice, Dr Robinson.

(Dr Dobbie) I myself have not done that.

Chairman: It would repay study, I think, in Dr Bray's view.

Chairman

859. I think there is no doubt that the team would wish that to happen. Sir Gerard Vaughan's point is that it does not seem to happen as often as we should wish it to.

(Dr Robinson) I was trying to give an indication of the structural process through which we should like that to happen, Mr Chairman. That is what I said. It gives them a forum in which to get involved.

Dr Bray

860. The industrial competitiveness division of DTI does not deal with competition in the ordinary business sense?

(Dr Dobbie) No, not competition.

861. And policy on company Acts, disclosure requirements, accounting standards and all that is dealt with by other people. We had evidence from an investment analyst/stockbroker recently. It appears that there is less treatment of the technology of products and processes in London than there is in New York investment analysis practice and less treatment in London today of technology than there was ten years ago, with the possible exception of pharmaceutical. Would you care to comment?

(Dr Dobbie) Treatment—do you mean approach by business analysts?

862. Yes?

(Dr Dobbie) That seems quite surprising. On the one hand we have complaints—I have certainly—of the best scientists, mathematicians and indeed engineers going into the City and taking jobs in the City. When I go to the City I certainly meet people who are very gifted.

863. In merchant banks or in stockbrokers?

(Dr Dobbie) Indeed, yes.

864. Which?

(Dr Dobbie) In both. On the question of links between the City and industry this I hope should be boosted not just by the kind of approaches that Dr Hicks and Dr Robinson have mentioned earlier but also by the work that should arise from the budget measures announced earlier this week, especially on Business Angels, where individuals are to receive tax incentives to invest in small companies and that I think should assist their progress towards flotation. The one thing that we have in the United Kingdom, that they do not have in Japan, is a stock market that allows relatively easy flotation of firms. It is much more difficult to get a flotation of a firm in Japan than it is in the United Kingdom.

865. Have you looked at an actual sample of an investment analyst's report in London and compared it with a comparable report in New York?

Mr Batiste

866. Mr Chairman, I should very much like to follow on that point because we recently received from the Stock Exchange in London evidence which suggested that they had introduced new criteria for assessing the listing of research and development based companies to make them an attractive alternative for fund-raising for R&D activities, yet the evidence that we have received from such types of companies which have tried to deal with the Stock Exchange is that they have found it extremely difficult and they find it easier to raise capital in the United States than they do in the United Kingdom. When we were in Cambridge, for example, we were told of several examples of UK companies which had gone to the United States to raise money after being refused by the Stock Exchange. Indeed, in my own constituency a similar case occurred recently. Is there any analysis of why it is, if indeed it is, that the criteria established by the Stock Exchange in London for these types of companies seem to be less user friendly than those that exist in the United States?

(Dr Robinson) Mr Chairman, there are a lot of anecdotal statements around. I am not familiar with any comprehensive analysis that is conclusive and well recognised. In my own conversations with companies I sense something of the mood, particularly over the past year, where companies have said they feel it is less user-hostile than it used to be. However, I am not aware of any definitive study.

Chairman

867. Nevertheless, it is an important issue worth looking at.

(Dr Robinson) Yes.

868. The comparative performances between the City and industry are different.

(Dr Robinson) Yes, and there is one other aspect that I do not think we can ignore if we are fully addressing the issue, which is the entrepreneurial, cultural environment.

Mr Batiste

869. I was talking specifically in stock market terms. Entrepreneurial environment is obviously different again.

(Dr Robinson) Yes, there are the two things. There is the willingness for people to have a go and then there is the availability to fund it, as it were.

Mr Miller

870. You are aware that we are interested in support for industrial collaboration and we have seen some areas of great interest to the Committee in other countries. In May of this year Mr Heseltine announced that "in view of the decision to increase support for

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technology transfer and best practice activities DTI will be reducing its support for industry/industry collaboration through its innovation budget and from 1 September will only support projects which will result in exceptional economic benefit". First of all, may I ask you whether since 1 September there have been projects of exceptional economic benefit that you have identified in this process?

(Dr Robinson) I am certainly not aware of any, Mr Chairman. I do not know that we have received any applications.

871. Secondly—and this comes back to the complicated picture of what is happening in respect of AEA, Warren Spring et al, trying to home in on what is actually happening—some members of the Committee visiting AEA looked at some of the work that is organised round clubs of companies. How much is currently spent on the industry/industry collaboration which is to be reduced and does this include collaborations with research and development organisations such as AEA? Perhaps you could also expand that and tell us what other areas they are?

(Dr Robinson) First if I may clarify the point about industry/industry collaboration and the DTI approach, many of the programmes that we support continue in place—EUREKA, LINK, some we have already mentioned—do already involve industry collaboration. Our specific policy statement was to announce that the industry specific, i.e. solely for industry/industry collaboration without overseas and without university involvement, that went under the heading of Advance Technology Programmes and General Industry Collaborative Programmes, those are the ones that we announced that we will not be funding in future, other than in exceptional circumstances. This has been interpreted on the one hand that we are anti-industry collaboration—absolutely not, we are very pro-industry collaboration. What we observe is that industry/industry collaboration is often the norm in research and development these days. Therefore, in looking at the balance of our programmes and priorities we deemed that the market forces driving industry to collaborate with industry were sufficiently strong that we did not need artificially to prime the pump compared with our other priorities. You mentioned AEA Technology and RTOs. The RTOs benefited from a number of DTI schemes including the industry/industry collaborative programmes. Our whole technology transfer thrust is very much in the line of what the RTOs are good at. They have a lot of contact with industry and therefore are in a good position to take the benefit of our programmes that are user led in technology transfer areas. We are also aware that the shift of our emphasis will take time for some individual RTOs to accommodate to and we are having individual conversations with individual RTOs as to the meaning and significance for them. I should have to say that all the RTOs that we talk to are very supportive of our shift in policy. They are coming to terms with it and we are helping them with that.

872. What are these exceptional circumstances then?

(Dr Robinson) At the moment, Mr Chairman, I think that we have not laid down any preconditions as to what we will say.

Mrs Campbell

873. Dr Robinson, may I take you to an RTO that is not very supportive, as far as I know, the Welding Institute near Cambridge, in which I have an interest. It is probably one of the largest technology transfer intermediate institutions which we have in the United Kingdom. I understand that about 20 per cent of their funding comes from the DTI and I understand that this funding is under threat. They are very worried that no announcement has been made about the funding of technology transfer mechanisms to date. I wonder whether you could say something that will allow me to give them a message to put their mind at rest.

(Dr Robinson) I am not sure when you last spoke to them, but I had a meeting with Bevan Braithwaite last week on the subject and I recognised the difficulties.

Lynne Jones

874. Does it?

(Dr Robinson) Well, the question was, can I give you a message to take back to the Welding Institute, and I said that I talked to them direct last week.

Mrs Campbell

875. Recognising that that is a very good example of the sort of technology transfer that we want to encourage is the DTI intending to withdraw its funding from institutions like that?

(Dr Robinson) We are not intending to withdraw our funding from anywhere. We are looking at what our new priorities are and where will we put our funding, and we are in dialogue with the Welding Institute on, what it is that they can offer for our new programmes. The difficulties that they have are that they have a programme profile that is coming to an end through 1994-95 and therefore they are looking ahead of most other people to "exactly what it is that we can get some money out of you for", which is why we are having a personal dialogue with them. At the same time we are making them aware that there are lots of other people competing for our funds.

Mr Miller

876. Mr Chairman, if I might just make an observation here, in the recent visit to Sizewell I was interested to note that one of the few skills that were imported in respect of the fabrication of plants in the heart of the complex was welding skills that had to come from the United States.

(Dr Robinson) Mr Chairman, I am not sure whether I am allowed to do this or not, but the Welding Institute has professed to me that they are world leader, so I cannot comment myself.

Mr Miller: Maybe not as big as it could be.

Chairman: All right, I think that we can note that for the record. It is not surprising—they are

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Westinghouse. I am conscious of the fact, Dr Robinson and colleagues, that you have been here now for over an hour and a half. I think therefore we might have two or three quick questions and probably two or three quick answers.

Lynne Jones

877. Mr Chairman, I think that in fact that has been adequately covered other than just to say that in Japan they do not take the attitude that they should not be encouraged, that the state should be investing in industry and industry co-operation, and we heard of schemes that were dependent upon more than one company participating.

(Dr Robinson) I talked to a lot of industrialists in Japan about those schemes as well, and we would be happy to talk about them if you want to, Mr Chairman.

Chairman: Very good, thank you.

Dr Williams

878. Mr Chairman, may I just ask in general about these one stop shops setting up these facilities. What broadly is their aim and what will be their function?

(Dr Robinson) The Business Links themselves?

879. Yes?

(Dr Robinson) The role of the Business Links is very much to recognise that in local communities there are many organisations offering support to local industries, and local industries often get very confused with where they are supposed to go to get help for a particular purpose. The whole strategy of Business Links therefore is to make it simpler to provide support for local industries on the ground, bringing together the people who are already involved in that activity. It gives us a very good focus for policy to apply at the local level.

Chairman

880. And is this the main role of your technology counsellors?

(Dr Robinson) Absolutely, Mr Chairman.

Chairman: Right, thank you.

Sir Trevor Skeet

881. I am very interested in your technology brokerage. I wonder whether you could clarify that and indicate which companies you intend to attract it?

(Dr Robinson) The starting point is the recognition that the overwhelming majority of total R&D is done outside the United Kingdom. The Japanese have always been very good at networking into the rest of the world—why don't we learn from them? We have some schemes, the Overseas Science and Technology Expert Mission, the Overseas Technology Information Service, engineers to Japan. But we have a feeling that we are not perhaps doing as much as we might and we are not getting as much advantage out of this as we might. We have set up a special group under Richard Hinder, who used to be our Science and Technology

Counsellor in Japan on networking. At the moment they are in a series of consultations having monthly seminars with groups of companies thinking about what we are already doing and what more can come out of it. The ideas that have come out of it so far we will then analyse and decide how best to use them. Perhaps we could take more advantage of UK companies that are already operating internationally in the networking context. Secondly, there are mechanisms like the German Chambers of Commerce, like the institutions that most of the states of the United States have set up as part of the inward investment programme and like the Japanese trading companies, which actually have very extensive international contacts. By and large therefore we are quite willing to be involved if we can find the right role.

882. But of course you have not overlooked the fact that the Japanese and also the Americans have invested very heavily in the United Kingdom, much more here than the rest of western Europe?

(Dr Robinson) Yes.

883. And that is another avenue which can be considered for this purpose?

(Dr Robinson) Indeed so, Mr Chairman. I think that we are at the beginning of something very important in this programme.

Sir Gerard Vaughan

884. Do you intend to charge for these services?

(Dr Robinson) You mean for the Overseas Technology Brokering Service? I think that it is too early to say. We recognise that some of them inevitably will come free, as it were, as a government expense, but to the extent to which we can derive a direct individual commercial benefit from them, then it might well be a charged service. Whether it is us that is charging or whether it is a service that in fact some of the RTOs suggested they might provide, is yet to be determined.

Mr Batiste

885. Some of those providing evidence to the Committee have criticised the department's focus on small and medium enterprises. Would you care to rebut that?

(Dr Robinson) Firstly, Mr Chairman, the focus on small and medium enterprises does not mean that we are not supportive of large companies. It does not mean that. Secondly, I think that we need to recognise that some small and medium enterprises might be technology followers but others might be technology leaders. Increasingly, many of the developments in technology are coming out of small companies. The two parts of our thrust are, I think, spreading the best technology practice from the leaders to the followers by focusing on small companies; then secondly, recognising that small high tech companies are easily able to have that total profile, particularly, for example, on relationships with Research Councils. There is also the fact that with small companies we actually feel we can make a difference with what we do. It is difficult to say

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how we are going to tell a large multinational to do its job better than it is already doing it. With small companies we can make a difference.

Chairman: Thank you.

Mr Powell

886. The European Community, as it used to be called, has relay centres which have been established to promote opportunities for engaging in European research and to disseminate its results. Have there been any problems with this in the past and can you give us some idea of the opportunities that will be open to United Kingdom industry as a result of much better information becoming available?

(*Dr Robinson*) I think that we need to distinguish two things in there, Mr Chairman. On the Relay Centres as a vehicle for disseminating results from European programmes, the line that we have taken with the Commission is that one key is to build dissemination and the route to exploitation in the definition of the programme itself so that people who might benefit from the programme are actually in at the start, as it were. They may not be in at the centre of the programme, but the dissemination and exploitation is built in from the start. Whether that is done from a Relay Centre or whether it is done from an RTO or a university we are quite relaxed about, providing a vehicle that is actually on the dissemination path is part of the programme to start with. The second thing, which I think comes back to the really fundamental point about the importance of calling it "technology access" versus "technology transfer", is that we need to have a model that when companies want technology—we do not predefine where it should come from. Therefore, we need to have a mechanism within the system, to deal with that which is what we are trying to do, so that there is a point in the system that companies can go to and say, help me with technology independent of where it might come from. We think that is of critical value. So to the extent to which Relay Centres are post factum attempts to disseminate only European Commission R&D programmes we feel that they are less successful.

Chairman: Very good, thank you. Final question, Cheryl Gillan.

Cheryl Gillan

887. I have one quick question on EUREKA. The DTI annual report shows a significant fall off of the money in that project. What savings do you expect to come from the refocusing of support for EUREKA and how confident are you that British industrial involvement in EUREKA will be maintained?

(*Dr Robinson*) That is a good question, Mr Chairman. Dr Hicks will clarify the point about the funding assumptions on EUREKA. Again our focus will be on smaller companies from a funding point of view, but at the same time also encouraging the brokerage role that we play for larger companies. Over the past years there has been a significant increase in the number of companies that have been involved in EUREKA, without being funded to do it, because they established the brokerage benefits out of it. I think that there is a

legitimate question and it is one that we are observing closely, that is, the extent to which companies will continue to feel the benefit to be in EUREKA unless they are being paid for it. I again remind colleagues that the pattern of international collaboration between companies is very strong so our focus is to get companies who might not otherwise be involved to see the benefit, and again it comes back to our focus on small companies. If we are only funding companies to do what they would have done anyway or, even worse, funding them to do things that actually were not worth doing unless somebody gave them the money to do it for nothing, then that would be wrong, so it is a very difficult balance to make.

888. I should like to ask for some clarification on that, but I will wait till Dr Hicks has answered.

(*Dr Hicks*) Mr Chairman, we announced in the change of policy that we were going to reduce our support in EUREKA so that we should support smaller firms through all phases but larger firms would only get support in the early phases. It could be that that will result in fewer projects under EUREKA. The figures in the annual report are for DTI-funded EUREKA projects in that particular edition. Last year two thirds of the projects that were announced were unfunded—they were not funded by the DTI—and in a sense that is a gain for the public purse if companies are wanting to collaborate across Europe without public support. We may well change the presentation in the Report back, because we think it gives a better measure of what is actually going on in collaboration. It would appear in EUREKA that we have moved from a position where it was unusual when we started for companies to collaborate across Europe, to where it is now something that the larger companies look at perhaps not routinely but they certainly look at far more seriously and collaborate with companies even without public funds.

(*Dr Robinson*) Mr Chairman, as a civil servant I know that I am not supposed to feel passionately about anything, but as we have already established I am not really a civil servant —

Chairman

889. Not for much longer!

(*Dr Robinson*) There is a point here about the small companies in Europe that is desperately important. The small companies who are in the technology business have to operate on a global scale. There is no such thing as a niche market for scanning electro-microscopes in Northumberland. It does not work that way. They have to operate on a world scale. Now since often technology comes from overseas and often the leading edge markets are overseas—the leading edge markets are often in the United States—the general pattern for international collaboration of small high technology companies will tend to be with Japan or with the United States more often than not. If we feel that it is part of our obligation to tease it out, and if we feel that building a collaborative structure across Europe is important, then we have got to look for small high technology companies and the extent to which Europe is a spawning ground for them and there is a European

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DR ROBINSON,
DR DOBBIE and
DR HICKS

[Continued

[Chairman Contd]

market that drives them forward. If it does not happen that way then the tendency will still be partnership with America and Japan. I am not saying that is bad, but if you want to focus on Europe you have to get that network of small high technology companies working, and that is our drive in EUREKA.

Cheryl Gillan

890. Are you satisfied on the European scene with the support that you are getting from the Commission and the direction that the Commission is going for, for example, on negotiations on support framework?

(Dr Robinson) I am not sure that we are dissatisfied.

891. Tell me more—it sounds as if you are not entirely satisfied!

(Dr Robinson) I am always impatient, as you can probably tell. On the statements that I have given this evening about small companies and international collaboration, dissemination and so on, I think these are issues that the Commission very much recognise and are trying to adopt in the mechanisms of their programmes. In that sense we are satisfied so far.

Chairman

892. Modest progress?

(Dr Robinson) Modest progress, Mr Chairman, yes.

Lynne Jones

893. Dr Robinson, at the beginning you said that there was evidence that companies were spending more on research and development during the recession, and you mentioned the CBI survey. Was there any other evidence?

(Dr Robinson) The R&D Scoreboard was the other evidence that I mentioned which between 1992 and 1991 showed a 6 per cent increase in the R&D spawned by companies.

Cheryl Gillan: But what about over a longer period—that was just over those two years— if you took it back to a year when it was at a higher point?

Chairman

894. Why do you not get that down in writing so that we can see it, let us say, over five years as to how performance in R and D was.

(Dr Robinson) The point I was trying to stress as much as anything is the pattern that we see developing now looking out to the future. We will give you that, Mr Chairman.

895. Very well, thank you. Thank you very much indeed, Dr Robinson, Dr Hicks and Dr Dobbie, for coming here to answer our questions, and particularly for the way in which you have done it under not too good circumstances. If this is you under 'flu, Dr Robinson, my goodness me, you must be very potent when you are well. Thank you very much. We wish you well in the future.

(Dr Robinson) I wish you well too, Mr Chairman. It is a very important subject.

Chairman: Thank you very much. The meeting is adjourned.

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**Evidence submitted by the Department of Trade and Industry
following oral evidence given on 8 December 1993 (29 December 1993)**

1. LINK: EXPLANATION OF TERMS AND EXPENDITURE FIGURES FOR DTI'S PARTICIPATION IN LINK

At the hearing on 8 December, the Committee asked about DTI's actual spend on LINK to date and how it related to Table 13 of the Trade and Industry Expenditure Plans Report 1993-94 to 1995-96. The Department agreed to supply a written memorandum to support the oral evidence.

1.1 The LINK scheme consists of a number of **programmes** each covering a technology area, and each consisting of a number of separate collaborative **projects**. Each project involves one or more industrial partners and at least one research base partner. At 30 September 1993, there had been 34 Programmes, consisting of 86 completed projects and 354 projects which were still underway.

1.2 DTI's annual spend on LINK, since the start of the scheme, is as follows:

1988-89	=	£ 0.05 million
1989-90	=	£ 1.86 million
1990-91	=	£ 3.80 million
1991-92	=	£ 9.87 million
1992-93	=	£15.80 million
Total spend to 31 March 1993	=	£31.38 million

1.3 The Trade and Industry Expenditure Plans Report 1993-94 to 1995-96 describes annual progress of the LINK scheme. The figures for "Programmes" presented in Table 13 are for *new* programmes only, i.e., programmes announced during that particular financial year (1991-92 to 1993-94). Whereas the figures for "Projects" relate to progress during the year on *existing* programmes. Most of these programmes would have started in previous financial years. "**Project costs**" are the total cost to carry out a project; it includes both costs to government and to industry. It does **not** equate to payments made by DTI, i.e., "**spend**", during the financial year for those projects.

1.4 Table 13 shows much smaller project costs in 1992-93 than in 1991-92. This is because, in 1991-92, industry and the science base put forward an exceptionally large number of collaborative projects for support and this is reflected in the large figure for "project costs". The rate of project proposals submitted then declined rapidly during the following year, but has now reached a steady state. Likewise, the rate of invoicing has stabilised, and DTI **spend** has now reached a steady state of about £15 million per annum.

1.5 For the LINK scheme as a whole, it typically takes about six to 18 months between Government announcing a programme and industry and the science base putting forward specific agreed project proposals. A similar time-lag follows before the collaborators (industry/science base) submit their first invoice for payment. Therefore, DTI **spend** on projects under the **Surface Engineering Programme** (announced on 7 December 1993) will probably not occur to any significant degree before financial year 1995-96.

2. INDUSTRIAL R&D: FINDINGS FROM THE UK R&D SCOREBOARD SHOWING THE PATTERN OF INDUSTRY'S SPEND ON R&D OVER THE LAST THREE YEARS.

At the hearing on 8 December, the Committee asked about industry's spend on R&D; in particular, the trend shown in the UK R&D Scoreboard in industrial R&D over the past five years. Figures for the past three years are given below, as the R&D Scoreboard only started in 1991.

2.1 The UK R&D Scoreboard has only been in publication for three years: 1991 to 1993. These publications reported figures quoted by companies for the years 1990, 1991 and 1992. The overall percentage increases reported during those years were 12 per cent, 6 per cent and 6 per cent respectively.

2.2 However, these figures are not comparable year on year. The way the Scoreboard is compiled makes it impossible to relate absolute figures of R&D spend for these years to the percentage changes. The Scoreboard is compiled from the annual reports of UK listed companies who declare R&D spend; the change figure is calculated from the figures for the current and the previous year which are quoted in their reports. Since both the identity and the total number of companies appearing in the Scoreboard change from year to year, any attempts at a trend analysis, other than the very superficial percentage increase, would be unreliable.

2.3 The 1993 edition of the Scoreboard does however contain some historical data which can be compared in absolute terms, as it was picked up from past copies of the company reports. Although the absolute figures do not tie in with past copies of the Scoreboard, the percentage figures are not too far out. The following tables try to summarise the figures:

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Scoreboard Year	R&D Spend in Year	Spend (£m)	Per cent Change
1991	1990	6,076	12
1992	1991	6,284	6
1993	1992	6,475	6
For the 1993 Scoreboard	1990	5,749	
	1991	6,126	6.55
	1992	6,475	5.69

Further evidence submitted by the Department of Trade and Industry following oral evidence given on 8 December 1993 (13 January 1994)

Q1: In Q826 you mention that "The DTI has sponsored a couple of programmes with universities recently"; Could you give details of these programmes? Is it expected that they will continue?

1.1 The two programmes concerned were the "Support for Technology Audits" and the "Strengthening Industrial Units" Schemes. These were originally announced by Mr Peter Lilley, the then Secretary of State for Trade and Industry, on 10 October 1991. The schemes were set up to help Higher Education Institutions (HEIs) improve the commercial and industrial exploitation of their scientific and technological strengths.

1.2 Eligible institutions were invited to submit proposals for grant assistance in two separate one-off competitions. The closing date for entries was 31 January 1992 for both schemes. Over 180 proposals were submitted for consideration and £6 million in grants were awarded to start from June 1992.

1.3 The Technology Audits Scheme (44 awards given, worth £1.9 million in grants) provided grants of up to £50,000 for HEIs to carry out an audit of their technology base. The aim was to identify and assess research strengths with commercial relevance. The audits were largely managed by external consultants and completed between June and December 1993. DTI sponsored a two-day conference in December 1993 to enable HEIs and industry to explore and elucidate best practice in technology audit, based on their experience gained under the scheme.

1.4 The Industrial Units Scheme (37 awards given, worth £4.1 million in grants) is helping academics to manage and market their research more effectively. DTI is providing grant assistance over three years, of up to £100,000 per HEI, to strengthen an existing industrial unit, mainly by supporting the recruitment of professional staff with expertise in marketing, management, patenting and other disciplines. In a few exceptional cases, grants of up to £200,000 have been provided to establish new units. DTI project support for these Industrial Units is set to continue for an average of two more years.

Q2: In evidence to the committee, Cambridge University told the committee "[LINK] still carries a significant risk in that, if the outcome is judged by the DTI to be unsatisfactory, the grant funds may even be reclaimed by the Secretary of State." Is this the case? If so, what criteria are used to decide whether grants should be repaid?

2.1 The collaboration agreements for LINK contain a clause which reserves the right of the Secretary of State to withhold, or reclaim, payment from collaborators who are failing, or have failed, to reach prescribed targets. The targets, and a time scale for their achievement, are agreed between the research partners and the sponsors at the start of each LINK project and are stated in the collaboration agreement. The withdrawal of one or more of the collaborators during the project is the most obvious way in which the agreed targets may not be reached. Such clauses are normal practice in collaboration agreements and are used for other schemes run by DTI and other Departments.

2.2 DTI has **not** reclaimed any funding from any of the over 400 LINK projects started, since programmes began in 1988. Only very rarely has funding been withheld, for example, when collaborators were obviously unable to meet targets to which they had agreed.

Q3: How will technology counsellors for business links be selected? What training will they be given? To what extent is their role seen as promoting local networks between technology sources and industry? And to what extent is it to be that of identifying the best source of technology, wherever it might be?

3.1 Selection of Innovation and Technology Counsellors will follow the procedure established for all Business Link employees, i.e., it will be the responsibility of the Business Link management and they will be Business Link employees. However, in order to provide some help in what may be an unfamiliar area, an outline job specification, check list and model job advertisement has been prepared by DTI, as an aid to Business Links. In preparing this, DTI has drawn extensively on the experience of those who have already operated various forms of technology counselling services.

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3.2 Training in Business Link procedures will be the responsibility of the local management and DTI expect that some of the counsellors will also be trained personal business advisers. The Department will, however, be organising regular meetings of counsellors to brief them on innovation and technology topics, to encourage the spread of best practice and help the networking of those appointed. Attendance at these meetings is a core requirement for DTI support of counsellors.

3.3 DTI is currently consulting widely on a proposal to support the development of local networks of those able to provide technological assistance or advice to companies (NEARNET) and to network centres of national technological expertise offering help to SMEs (SUPERNET). At the moment DTI see the innovation and technology counsellors as playing an important role in establishing the local NEARNET and using members of the network to help companies innovate and to solve their technical problems.

3.4 Although a substantial proportion of enquiries are likely to be answered locally, there will be those which require national or international expertise. SUPERNET has been conceived to respond to this requirement. Organisations such as HEIs, research and technology organisations and Government laboratories, often have teams of national or international standing. We are consulting on how this expertise can be made better known and made available to companies through Business Links. This service is intended to fulfil the commitment by the President of the Board of Trade to place national and international expertise on industry's doorstep.

Q4: The subject of industry/industry collaboration was discussed in Qq870 to 875. The committee would like more information about this. In particular, how much was spent in each of the past five years on supporting industry/industry collaboration? What are the implications of the change of policy for club R&D (Q871), and what assessment has been made of its implications for research and technology organisations? Please give examples of the sort of measures, if any, that may be taken to enable RTOs to accommodate to the DTI's shift in policy (Q871).

4.1 DTI chiefly supports industry/industry R&D collaboration through the Advanced Technology Programmes and General Industrial Collaborative Projects scheme. DTI Innovation Budget outturn figures for expenditure on these two schemes, for the five years up to 31 March 1993, are set out below.

*Expenditure (in £k) from the Innovation Budget 1988-89 to 1992-93
(Excluding funding to public bodies)*

Scheme	1988-89	1989-90	1990-91	1991-92	1992-93
Advanced Technology Programmes	8,211	8,728	11,768	20,234	30,220
General Industrial Collaborative Projects	9,174	14,991	17,185	18,782	25,644
Total	17,385	23,719	28,953	39,016	55,864

4.2 DTI will honour its existing commitments for supporting the pump-priming of clubs and will consider proposals for funding new clubs, specifically where the latter are market-led and focus on providing effective transfer and diffusion of technology to small firms. RTOs are expected to play an important role, both in these activities and also in DTI's wider promotion of technology transfer to SMEs. They will, for example, continue to be key participants in the ongoing Carrier Technology Programme, and to play an important role alongside DTI in certain LINK programmes, Post-graduate Training Partnerships and other activities which contribute to technology transfer. Further in the future, Business Links will enable SMEs to access more easily the expertise of RTOs. DTI continues to work with RTOs in developing mechanisms for delivering DTI's new policy objectives, with a view to ensuring so far as possible, that full use is made of their expertise.

Q5: Does the DTI plan to ensure the continued existence and availability of the expertise and information built up at those research centres currently in Government ownership, whatever the ownership of those centres? If so how will it do so?

5.1 The Department is concerned to ensure that it will continue to have available to it the expertise and information necessary for it to fulfil its own functions. This concern underlays the need to set out a clear customer-contractor relationship between the Headquarters Divisions and the Research Establishments and was taken into account in the decision to create the new National Environmental Technology Centre, which is merging the environmental technology skills and facilities of Warren Spring Laboratory and AEA Technology. It has also been addressed as part of the current review of the future of the Department's other Research Establishments. It is the view of the Department, however, that moving the ownership or management of these establishments into the private sector does not pose any threat to their ability to maintain their expertise or scientific standing, or to provide appropriate services for DTI.

5.2 In any event, the Department's needs for technical or scientific advice and assistance are not only met from its own Research Establishments. Much of the Department's requirements are tendered and, in the

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course of the tendering process, the Department can make a judgment about the best source of the expertise for any particular question. This will continue to be the case whatever the ownership of the Research Establishments.

Q6: In answer to Q886 you said:

"We need to have a model of when companies want technology—we are not predefining where it should come from—and, therefore, to have a mechanism within the system, which is what we are trying to do, so that there is a point in the system that companies can go to and say, help me with technology independent of where it might come from. We think that is of critical value. So to the extent to which relay centres are post factum attempts to disseminate only European Commission R&D programmes we feel that they are less successful."

Are you confident that a single centre can provide access to all the information available?

6.1 In the evidence given on 8 December, Dr Robinson was referring, not to a single information centre, but to a single point of access in a technology information network. That single point of entry is important in terms of accessibility for SMEs, but obviously in many cases the customer's need, once it has been assessed at the entry point, will be met by a more specialist service provider elsewhere in the network.

6.2 To take the example of EC enquiries, a local access point such as a Business Link might often need to refer an enquirer to one of the four UK Relay Centres who are charged with promoting the Community's research and development programmes and helping organisations get involved in EC R&D projects, and ensuring that results arising from EC R&D projects are disseminated and exploited. In another case, the customer's need may relate very specifically to an individual EC R&D programme for which the most appropriate source of expertise would be the relevant programme manager either in DTI or another Government Department.

6.3 The model does not of course rule out direct contacts being made between the specialist service providers and the industrial Community. For example, UK Programme Managers already have their own contact list of interested parties to whom they disseminate information about EC R&D opportunities on a regular basis.

6.4 The overall objective must be to construct a network which is flexible and user-friendly, especially to the new entrant whose need will be defined in terms of his own business activity and not compartmentalised according to the particular administrative organisation of possible sources of help whether in the UK or Brussels.

6.5 Dr Robinson was also seeking to make clear that dissemination and exploitation would be less effective if organised on a post-facto basis, rather than built into programmes up front. The UK has consistently stressed this to the EC Commission, and believes that dissemination and exploitation objectives should be identified at the stage of formulating project proposals.

Q7: In Q893 the Committee discussed research and development spending by companies. Could you give figures for company R&D over the last 10 years?

7.1 The Accounting Standards Board introduced a requirement for companies to disclose R&D expenditure in their company accounts in 1989 (SSAP13). The revised standard allows better comparisons to be made between companies, since differences in accounting techniques made inter-company comparisons difficult to interpret in previous years. Prior to 1989, companies had discretion as to whether they disclosed their R&D spending in their annual accounts. As a consequence it is not possible to produce aggregate figures for company R&D spend, similar to that appearing in the UK R&D Scoreboard, over the last 10 years, as many companies did not reveal this data in their annual reports.

7.2 Figures for the last three years, which are available from the UK R&D Scoreboard, were sent by Dr Robinson to the Committee on 23 December 1993.

ISBN 0-10-278194-X

